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CALIFORNIA ELECTRONIC WIND PERFORMANCE REPORTING SYSTEM: SUMMARY OF MODIFICATIONS PERFORMED IN 2004

PIER INTERIM PROJECT REPORT

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California Electronic Wind Performance Reporting System: Summary of Modifications Performed in 2004

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SUMMARY

In 2004, the California Wind Energy Collaborative continued expansion and development of the Electronic Wind Performance Reporting System (eWPRS), successfully completing its contracted work. Performance and installation data for the years 1985 to 1995 and 2003 was added and is available for querying. The data from 1989 to 1995 and 2003 was taken from Wind Performance Reporting System (WPRS) data provided by the California Energy Commission (Energy Commission) in electronic spreadsheet files. The data from 1985 to 1988 was taken from the printed WPRS summary reports published by the Energy Commission. The printed WPRS summary reports for 1985 to 1988 were scanned into PDF files and made available for download on the eWPRS website. A prototype data submission system was designed and implemented. The data submission system integrates into the existing underlying eWPRS database and provides a secure and intuitive interface for wind plant operators to directly enter WPRS data into the eWPRS.

1 INTRODUCTION

California's Wind Performance Reporting System (WPRS) was legally adopted in 1984, requiring the California Energy Commission (Energy Commission) to regularly collect and openly publish wind turbine installation and performance data on California's wind plants. Wind plant operators and power purchasers are required to submit data to the Energy Commission on energy production and the number and types of wind turbines installed. The Energy Commission collates and analyzes this data and then publishes annual summary reports. The reports also include discussions of the status of California's wind industry and details on the WPRS legislation. The printed summary reports are available from the Energy Commission and several public libraries. Electronic copies of many of the reports are available from the Energy Commission's website and from http://ewprs.ucdavis.edu.

The WPRS data is a valuable resource, providing direct and quantitative insight into the state of California's wind industry. In 2002, the Energy Commission contracted the California Wind Energy Collaborative (CWEC) to improve accessibility of the WPRS data by making it available online via the Internet. CWEC designed and implemented the Electronic Wind Performance Reporting System (eWPRS), a website with an intuitive interface to a database of WPRS data. The eWPRS was designed not only to meet the Energy Commission's immediate requirements, but also to be extensible so that it could eventually become the central warehouse for all WPRS data and information. It is envisioned that the eWPRS will eventually replace the printed summary reports and provide a simple, accessible single point of access to all WPRS material. The eWPRS is accessible at http://ewprs.ucdavis.edu. Details on CWEC's development of the eWPRS in 2002 are in the contractor's report to the Energy Commission titled "Electronic Wind Performance Reporting System: Final Report of First Year Activities".

CWEC also provided recommendations for future work to streamline and enhance the WPRS and eWPRS. The Energy Commission accepted a number of these recommendations and contracted CWEC again in 2004 to implement them. This report details this work.

2 GOALS AND DELIVERABLES OF 2004 WPRS/eWPRS EFFORTS

The contracted tasks for the WPRS/eWPRS in 2004 are summarized as follows.

Task 1. Support and maintain current WPRS/eWPRS

- Support and maintain web-based WPRS database.
- Incorporate 2003 WPRS data in to the eWPRS.
- Analyze the WPRS data, establish trends, and provide a statewide industry evaluation based on collected data.
- Prepare a Consolidated WPRS Report consolidating and analyzing the WPRS data for the year 2003.
- **Deliverables:** Draft and final consolidated WPRS reports for 2003.

Task 2. Incorporate 1985-95 Data in Web-Based WPRS Database

- Incorporate legacy WPRS data from 1985 to 1995 into the eWPRS.
- **Deliverables:** Web-based WPRS data retrieval system including 1985-95 data.

Task 3. Develop and demonstrate a web-based WPRS data submission system

- Develop a web-based WPRS system that allows operators and electric power purchasers to submit their reports directly into the eWPRS.
- **Deliverables:** Prototype and final web-based WPRS data submission system.

3 TASK 1: DESCRIPTION OF WORK PERFORMED

Task 1 – the support, maintenance, and updating of the current WPRS/eWPRS – was completed successfully. During 2004, the eWPRS required no intervention to continue regular operation. As with previous years of data, 2003 data was provided by the Energy Commission in summary spreadsheets. The summary spreadsheets contain data sorted, categorized, and totaled by the Energy Commission from the operator and power purchaser WPRS reports. The data in the summary spreadsheets was reviewed, corrected where necessary, re-sorted, reformatted, and then imported into the eWPRS database. 2003 WPRS data, along with data from the years 1985 to 2002, can now be queried from the eWPRS website. The ability to query key parameters over several years and return results in sorted tables remains unchanged, facilitating general data and trend analyses.

The Energy Commission elected to prepare the written WPRS report internally, eliminating the need for CWEC to prepare drafts of that report.

4 TASK 2: DESCRIPTION OF WORK PERFORMED

Task 2 – the addition of WPRS data from 1985 to 1995 into the eWPRS – was completed successfully.

WPRS data has been collected since 1985. However, only data from 1996 to 2002 was placed into the eWPRS during the initial 2002 effort. At the time, the Energy Commission believed that no accessible copies of WPRS data prior to 1996 existed, except for the summarized information in the printed summary reports. The raw operator and power purchaser reports were believed to have been discarded and any remaining copies of the summary spreadsheets used to prepare the printed summary reports were believed to be inaccessible on defunct electronic media. The data appearing in the printed reports, while extensive, was believed to have less detail than the data in the summary spreadsheets used to populate the eWPRS database. The 2002 eWPRS effort was therefore restricted to data after 1995.

For the 2003 effort, data from 1985 to 1995 was to be added to the eWPRS even if limited detail would restrict the querying options available for those years of data. The Energy Commission was able to locate summary spreadsheets for 1985 to 1995. From 1989 to 1995, the summary spreadsheets had comparable detail to the later summary spreadsheets. However, the earliest spreadsheets from 1985 to 1988 had limited detail, and the data in the printed summary reports was used instead to feed the eWPRS. Upon reviewing the 1985-1988 printed reports, it was discovered that the data in these early reports, unlike more recent reports, contain data with detail comparable to recent summary spreadsheets. WPRS data for the full period from 1985 to 1988 was therefore successfully added to the eWPRS without any limitations in querying capability for any years.

5 TASK 3: DESCRIPTION OF WORK PERFORMED

Task 3 – the development of a web-based WPRS report submission system – was completed successfully. The University of California, Davis Information and Educational Technology Desktop Enterprise Solutions group was subcontracted to develop the system based on specifications provided by CWEC. A fully functional prototype system was completed. However, the Energy Commission elected to postpone finalizing and deploying the system until they could resolve internal management issues with their own information technology department. Once these issues are resolved, the system can be demonstrated to prospective industry users, any necessary revisions can be made, accounts for data submitters can be created, and the system can be brought online. Currently, the only known items that may require revision before finalization are minor cosmetic ones.

The data submission system was designed to integrate with the existing eWPRS system and is built upon similar user interface principles and identical server components. The user interface is based on standard web forms. Report submitters need only an Internet connection and a standard web browser; no additional software is required on their end. The forms are designed to be simple and intuitive, dynamically updating to clearly indicate what data is required of the submitter. The submission system is served by the same PC computer as the eWPRS. As with the eWPRS, the primary software components on the server are Perl, PHP, and mySQL. PHP and Perl are used to generate the dynamic forms, perform basic input error checking, and to extract and insert data into the eWPRS' mySQL database.

The submission system is described in greater detail below in an illustrative example of a report submission.

An operator begins the data submission process by going to the data submission website with a web browser. The web address of the prototype submission system is http://ewprs.ucdavis.edu/html2/auth/. The address of the finalized submission system will be simpler. The operator is first presented with a login screen, as shown below in Figure 1.

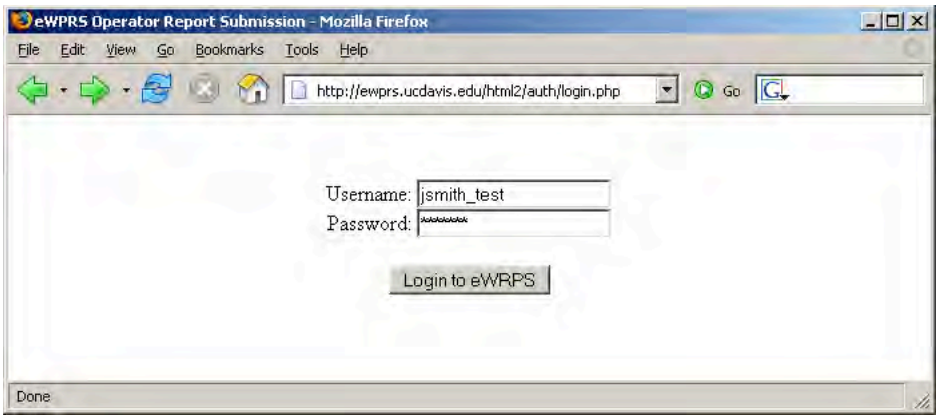

Figure 1. The operator login screen of the prototype eWPRS data submission system.

Each operator has a unique username and password combination. The passwords are stored securely in the eWRPS database in an encrypted form. Upon logging in, the operator is automatically shown his facilities, as shown below in Figure 2.

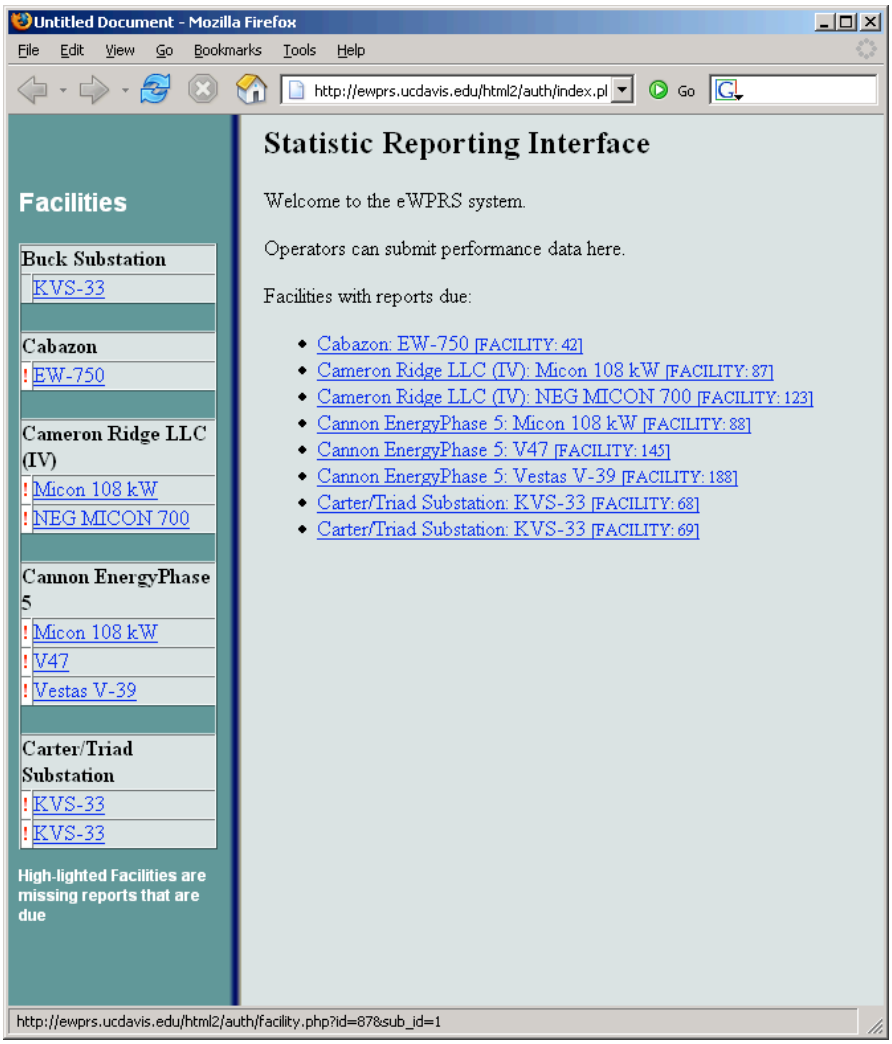

Figure 2. Upon logging in, the operator is automatically shown his facilities. Facilities with outstanding data are clearly indicated.

Note that this example uses a fictional operator and the set of facilities shown do not reflect any single actual operator. The prototype submission system interfaces with a copy of the eWPRS database so that testing of the system could be performed without risk of corrupting the actual, live database.

The left side of the screen shows all of the operator's facilities. This facility navigation list remains conveniently available throughout the data submission process. A red exclamation point preceding a listing indicates that the facility has outstanding data reports. The Buck Substation KVS-33 does not have a red exclamation point because its performance data is up to date.

The right side of the screen displays a greeting message that can be easily updated to include any important messages for data submitters. A list of facilities

with outstanding data reports is also provided. Note that the Buck Substation KVS-33 is not shown because, again, its performance data is already current.

To report performance data, the operator can select a facility in either the navigation list on the left or the list of facilities with outstanding data on the right. The operator is then taken to the data reporting screen, shown below in Figure 3.

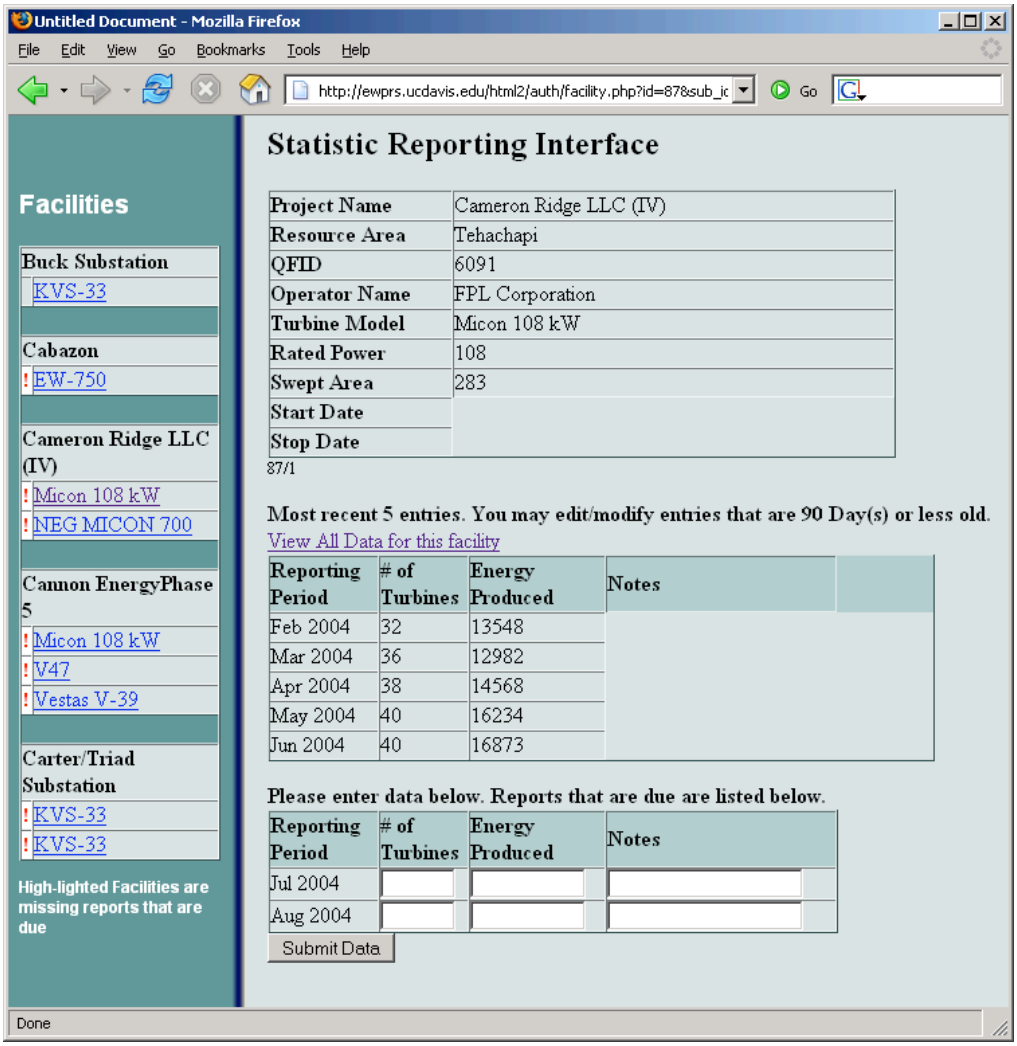

Figure 3. The data reporting screen of the prototype eWPRS data submission system.

Note that the data shown above is fictional and does not represent the performance of any actual wind facilities.

The facility navigation list remains on the left. In the main body of the data reporting screen on the right, details of the facility are shown on the top including the facility's project name, wind resource area, QFID (if applicable), operator, and turbine's basic specifications. This information changes very infrequently and

cannot be directly edited by the operator; the eWPRS data administrator must be contacted for changes.

The performance data of the last five submitted reports are shown for reference. Large changes in turbine or energy production numbers between past and current reports can thereby be easily detected by the operator, reducing the chance that data for a different facility is erroneously submitted. A link is provided to all past performance reports. The operator can modify previously submitted data within ninety days of the end of the reporting period so that errors can be corrected within a reasonable window.

At the bottom of the reporting screen, the operator can enter and submit new performance data. Reporting periods with outstanding data are automatically listed.

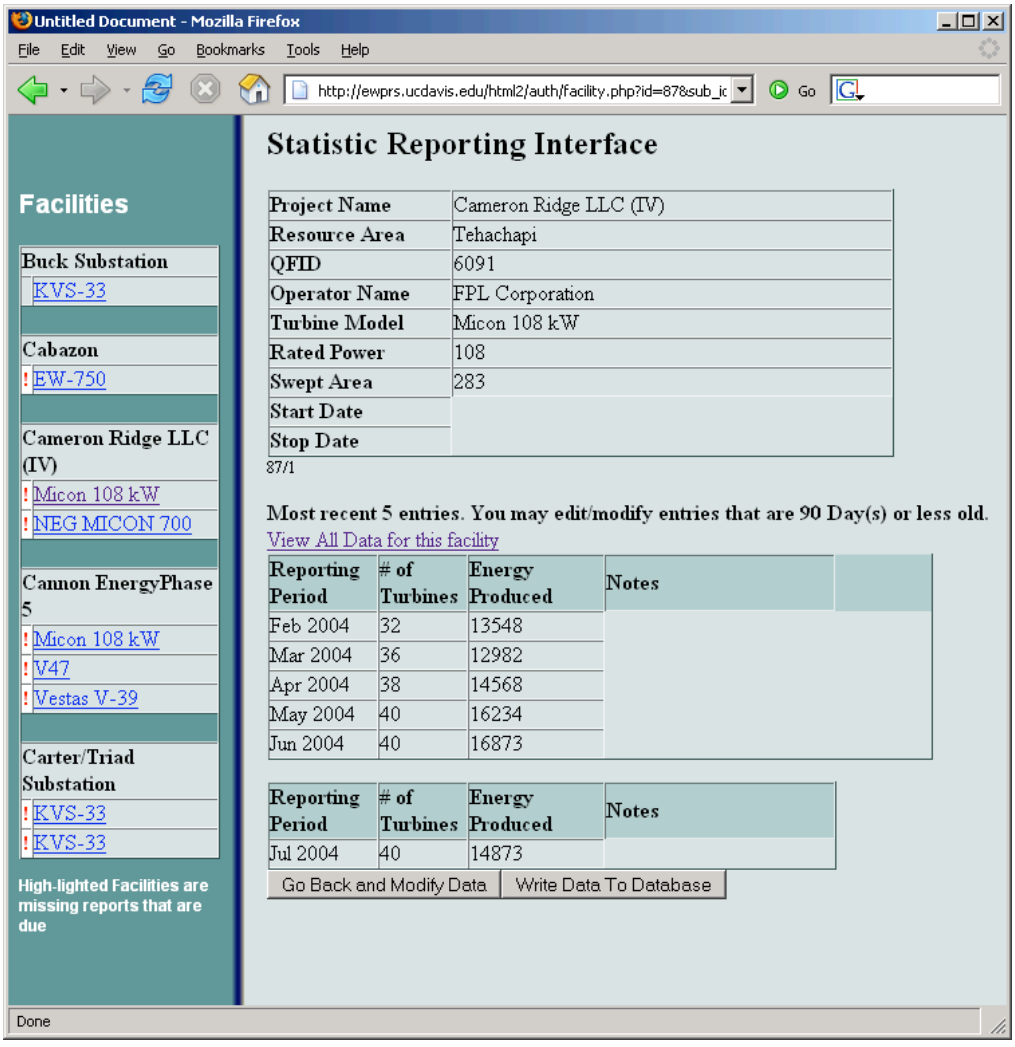

Figure 4. The submission verification screen of the prototype eWPRS data submission system.

Once new data is submitted, a verification screen is shown as in Figure 4. Once the operator selects *Write Data to Database*, the data reporting for that facility is complete and the operator can proceed to another facility.

6 CONCLUSION

In 2004, CWEC completed all the contracted tasks associated with the maintenance and expansion of the eWPRS as originally drafted, except where revised by the Energy Commission. Performance and installation data for the years 1985 to 1995 and 2003 was added and is available for querying. The data from 1989 to 1995 and 2003 was taken from Wind Performance Reporting System (WPRS) data provided by the California Energy Commission (Energy Commission) in electronic spreadsheet files. The data from 1985 to 1988 was taken from the printed WPRS summary reports published by the Energy Commission. The printed WPRS summary reports for 1985 to 1988 were scanned into PDF files and made available for download on the eWPRS website. A prototype data submission system was designed and implemented. The data submission system integrates into the existing underlying eWPRS database and provides a secure and intuitive interface for wind plant operators to directly enter WPRS data into the eWPRS.